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News Release

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Study shows importance of exposure age for Hanford nuclear workers' cancer risk

By DAVID WILLIAMSON
UNC News Services

CHAPEL HILL -- The ages at which workers are exposed to low doses of ionizing radiation apparently make a difference in whether they will develop cancer, according to a new University of North Carolina at Chapel Hill study.

UNC scientists investigated deaths among workers at the U.S. Department of Energy's Hanford Site in Richland, Wash. The Hanford Site produced plutonium for atomic weapons, including the first plutonium bombs dropped during World War II.

Researchers say the largest cancer risk from older-age exposures is for lung cancer.

"Findings of radiation-related cancer risks among nuclear workers have been questioned in the past by other scientists who concluded that most occupational exposures were too low to cause a detectable increase in cancer rates," said Dr. Steven B. Wing, associate professor of epidemiology at the UNC School of Public Health. "Predictions based on studies of survivors of the atomic bombings of Japan during the war suggested that cancer risks from radiation exposures of Hanford workers would be too small to detect."

The new study evaluated radiation risks by using measurements of workers' radiation exposures recorded on radiation-sensitive badges worn on the job, Wing said. Cancers were identified through death records. Researchers identified 8,153 deaths, including 2,265 from cancer, among 26,389 workers hired between 1944 and 1978 and followed through 1994.

"We found no relationship between radiation doses and deaths from causes other than cancer, primarily heart disease and stroke," he said. "Additionally, radiation doses received at younger ages were not associated with cancer deaths. However, readings on radiation badges worn by workers when they were ages 55 and above were associated with death rates for cancer, and particularly for lung cancer."

A report on the findings appears in the June 17 issue of Occupational and Environmental Medicine, a professional journal. Dr. David B. Richardson, assistant professor of epidemiology, is co-author.

The two found that cancer death rates increased, on average, about 3 percent for every additional rem (a unit of radiation dose) received at ages 55 and above, Wing said. For lung cancer, the increase was about 9 percent per rem. U.S. workers are permitted to receive up to five rem per year, roughly 15 times more than average annual background radiation.

"Findings of increased cancer associated with low-level radiation exposures among nuclear workers are important for several reasons," he said. "Among the considerations are common exposures to radiation from medical procedures, the push for new nuclear power plants and debates over whether to release radioactively contaminated metals into the consumer recycled-metal market."

"Studies of cancer following long-term exposure to low-level ionizing radiation are especially relevant to occupational and environmental protection standards and to compensation programs for radiation-exposed workers and veterans," Richardson said.

As people get older, they may become more susceptible to a variety of exposures, including heat and cold, infections, pharmaceuticals and toxic chemicals, he said. In contrast, researchers studying Japanese A-bomb survivors concluded that older people were less sensitive to radiation-induced cancer.

"Results from Hanford may be different because the older A-bomb survivors had to be especially strong to survive the immediate effects of the blasts," Wing said. "Survival of the fittest could have made radiation appear to be less important among the older survivors."

Older people may be more sensitive to radiation because they already have accumulated a lifetime of exposures to radiation, chemicals and other carcinogens, he said. They already may have gone through some of the cellular transformations that lead to cancer.

"Also, aging brings declines in immune function and the ability to repair genetic damage," Wing said.

Although radiation risks were higher for older workers in the UNC study, it would be inappropriate to conclude that younger people are not at risk, he said. He and Richardson could not examine cancers that did not lead to death, and they could not examine other possible effects of radiation, including genetic damage that could be passed on to children and impacts on developing fetuses.

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